A SURVEY OF INSECT PESTS BREEDING IN MANGO FRUIT IN DILI, EAST TIMOR

GLENN A. BELLIS[1], RAFAEL FALICIANO[2], AUGUSTINO ALVES[2] and MARK HEARNDEN[3]

[1]*Northern Australia Quarantine Strategy, Australian Quarantine and Inspection Service, PO Box 37846, Winnellie, NT 0821 (email: glenn.bellis@aqis.gov.au)*

[2]*National University of East Timor, Dili, East Timor*

[3]*Northern Territory Department of Primary Industry, Fisheries and Mines, GPO Box 3000, Darwin, NT 0801*

Abstract

A survey of 1345 mango fruit from 231 trees in Dili detected a 9.5% prevalence of *Deanolis sublimbalis* Snellen (Lepidoptera: Pyralidae) and a 14.7% prevalence of *Bactrocera* spp. fruit flies (Diptera: Tephritidae). No other mango fruit borers were detected and it is very unlikely that they occur in Dili. The absence of *Sternochetus frigidis* F. and *S. mangiferae* (F.) (Coleoptera: Curculionidae) suggests a low probability of their presence in East Timor.

Introduction

In Southeast Asia, a number of insects have been reported breeding in mango fruit, particularly red-banded mango caterpillar, *Deanolis sublimbalis* Snellen (Lepidoptera: Pyralidae), mango pulp weevil, *Sternochetus frigidis* Fabricius and mango seed weevil, *Sternochetus mangiferae* (Fabricius) (Coleoptera: Curculionidae), several *Bactrocera* Macquart species (Diptera: Tephritidae) and an undescribed species of *Nephopteryx* Hübner (Lepidoptera: Pyralidae) (Kalshoven 1981, Waterhouse 1993, Allwood *et al.* 1999, Anon 1999, Smith 1999). These pests not only affect fruit production through reduction in yields but can also impinge on exports, since many countries impose strict quarantine requirements on the import of fruit potentially infested with one or more of these pests.

Deanolis sublimbalis, S. frigidis and *Bactrocera* spp. have been reported from Indonesia but confirmed records from many of the individual islands in the Indonesian archipelago, including Timor, are lacking (Kalshoven 1981, Anon 1993, Drew and Hancock 1994). Consequently, the status of these pests on mango fruit in East Timor, a newly independent country which lies in this archipelago, is unclear.

Many species that breed in mango fruit are difficult to find as the only means of detection is to sample fruit destructively. Additionally, mangoes are very seasonal and provide only a brief window of opportunity to sample fruit. In many areas, fallen fruit is quickly eaten by domestic animals, making large scale sampling difficult. This paper reports the results of a recent survey for mango fruit pests in Dili, East Timor.

Materials and methods

Mango fruit were collected from fruiting trees in backyards in Dili in December 2003 and January 2004. In most cases, five fruit were picked from

each tree, although fallen fruit were also sampled opportunistically. In areas where fruiting trees were scarce, ten fruit were sampled from each tree. Samples from each tree were treated as a unit, so infestation levels were calculated for individual trees rather than for individual fruits. Tree owners were shown photographs and specimens of *D. sublimbalis* and *Sternochetus* sp. larvae and asked if these insects ever occurred in their fruit.

Fruit maturity, as gauged by flesh colour, was recorded for each mango sampled. Mangoes, including seeds, were dissected using a knife or secateurs and examined for the presence of borers or borer damage. The position within the fruit of borers or damage was recorded and all borers were collected, immersed in freshly boiled water for 5 minutes, then preserved in 70% ethanol for subsequent morphological examination.

The confidence level that pest specimens not detected in the samples were absent from the sampled population, was calculated using the formula of Cannon and Roe (1982):

$$\alpha \cong 1-\left(1-\frac{d}{N-(n-1)/2}\right)^{n}$$

where N is the estimated population size, d is the number of positives in the population and n is the number sampled. Confidence levels were calculated using an upper and a lower estimate for N, the number of fruit in the Dili growing region using a lower estimate of 90,000 (300 trees each producing an average of 300 fruit) and an upper estimate of 200,000 (400 trees each producing an average of 500 fruit), and d was given the value of 1. The result is the confidence level expressed as the probability of finding less than 1 infected fruit in the sample.

Results

Ten fruits from each of 38 trees and five fruits from each of 193 trees were sampled, giving a total of 1345 fruit from 231 trees. It was estimated that the majority of fruiting trees in Dili were sampled. A total of 1221 fruit (90.8%) were picked from trees, while 124 fruit (9.2%) were collected from the ground beneath fruiting trees. Three maturity stages were represented, with 114 mature (orange flesh), 102 partially mature (yellow flesh) and 15 immature (white/pale yellow flesh) samples respectively.

Deanolis sublimbalis and tephritid fruit flies were the only primary pests observed. Forty-eight specimens of *D. sublimbalis* were collected from 22 trees, indicating a prevalence of infestation of trees of 9.5%. *D. sublimbalis* were only collected from picked fruit. The infestation rates relative to fruit maturity are given in Table 1. All specimens of *D. sublimbalis* were found in the seed, although damage to flesh was usually also evident.

Table 1. Infestation rate of *Deanolis sublimbalis* relative to maturity of mango fruit examined in Dili, East Timor.

Fruit maturity	% of larvae collected	Infestation rate (%)
Mature	45	7.9
Partially mature	10	2.9
Immature	44	66.7

Fruit fly larvae (*Bactrocera* spp.) were present in 34 (14.7%) samples. All but four of the samples infested by *D. sublimbalis* were also infested by fruit flies and all but one of the samples infested by fruit flies were also infested by opportunistic beetle species (adult scarabaeids and nitidulids). Tree owners agreed that these were the only insects ever seen in the fruit.

The probability (level of confidence) that mango fruit-boring insects not detected in the samples are absent from the Dili mango growing region was calculated to be between 98.5% and 99.3%, depending on which estimate of the number of fruit produced in Dili was used.

Discussion

Dili serves as a major market for fruit grown in surrounding areas of East Timor. Consequently, pests able to be transported in infested fruit would be expected to be continuously brought into Dili for sale and subsequently become established there. Their absence in Dili suggests that other areas of East Timor may also be free of such pests. This is particularly true for *Sternochetus frigidis* and *S. mangiferae*, which can infest up to 80% of mango fruit and do not affect the external appearance (Cunningham 1991, Kalshoven 1981). Where these pests are present, infested fruit are likely to be harvested and sold in the marketplace.

The presence of *Deanolis sublimbalis* in East Timor is not surprising. This species has been reported from across Indonesia as far east as Papua New Guinea (Kumar 2001). A prevalence of 9.5% is comparable with that observed in the Philippines by Golez (1991) and probably does not impinge significantly on mango production. Mangoes of varying states of maturity harboured caterpillars, which agrees with the observations of Golez (1991). The relatively higher infestation rate of immature fruit may be due to a tendency for infested fruit to fall prematurely (Kalshoven 1981), thereby reducing the proportion that remain on the tree until maturity.

Several species of fruit fly, *e.g. Bactrocera papayae* Drew & Hancock, *B. carambolae* Drew & Hancock and *B. albistrigata* (de Meijere), which are important pests of mangoes, are known to be present in Timor (Drew and Hancock 1994, Allwood *et al.* 1999, Bellis and Brito unpublished data). No attempt was made in this study to identify larvae collected in this study so the actual species involved are not known. The prevalence of fruit flies in

mangoes may underestimate true rates as many immature fruit were sampled and these are often less frequently attacked by fruit flies than are mature fruit.

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References

ALLWOOD, A.J., CHINAJARIYAWONG, A., DREW, R.A.I., HAMACEK, E.L., HANCOCK, D.L., HENGSAWAD, C., JIPANIN, J.C., JIRASURAT, M., KONG KRONG, C., KRITSANEEPAIBOON, S., LEONG, C.T.S. and VIJAYSEGARAN, S. 1999. Host plant records for fruit flies (Diptera: Tephritidae) in South East Asia. *Raffles Bulletin of Zoology* Supplement **7**: 1-92.

ANON. 1993. *List of important plant pest already reported from Indonesia.* Pusat Karantina Pertanian, Jakarta; 232 pp.

ANON. 1999. *Final import risk analysis on the proposal to change the treatment for mango (Mangifera indica L.) fruit from the Republic of the Philippines.* Australian Quarantine and Inspection Service, Canberra; 26 pp.

CANNON, R.M. and ROE, R.T. 1982. *Livestock disease surveys: A field manual for veterinarians.* Australian Government Publishing Service, Canberra; 35 pp.

CUNNINGHAM, I.C. 1991. Mango seed weevil in Queensland. *Acta Horticulturae* **291**: 413-417.

DREW, R.A.I. and HANCOCK, D.L. 1994. The *Bactrocera dorsalis* complex of fruit flies (Diptera, Tephritidae, Dacinae) in Asia. *Bulletin of Entomological Research* Supplement **2**: 1-68.

GOLEZ, H.G. 1991. Bionomics and control of the mango seed borer, *Noorda albizonalis* Hampson (Pyralidae, Lepidoptera). *Acta Horticulturae* **291**: 418-424.

KALSHOVEN, L.G.E. 1981. *Pests of crops in Indonesia.* P.T., Ichtiar Baru, Van Hoeve, Jakarta; 701 pp.

KUMAR, R. 2001. *Insect pests of agriculture in Papua New Guinea, Part 1. Principles and practice, pests of tree crops and stored products.* Science in New Guinea, PNG; 723 pp.

SMITH, E.S.C. 1999. *Report to AQIS on two visits to the Republic of the Philippines in connection with area freedom of mango pulp and seed weevils during 1999.* Unpublished report to Australian Quarantine and Inspection Service, Canberra; 36 pp.

WATERHOUSE, D.F. 1993. *The major arthropod pests and weeds of agriculture in Southeast Asia: distribution, importance and origin.* ACIAR Monograph No. 21; 141 pp.